GUIDANCE ON ACQUISITION AND CONVERSION OF LOGISTICS TECHNICAL DATA TO DIGITAL FORM

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1. INTRODUCTION

This document provides Department of the Navy (DoN) programs and activities specific guidance on how to specify digital data formats for both the acquisition of new technical data and also the conversion of legacy data to digital forms that support the migration toward an integrated digital environment. The digital data formats set forth below apply to any data developed by programs or activities that must be distributed or used outside of the program or activity or used within the DoN infrastructure programs and systems. The guidance considers both existing technologies and existing data standards and specifications for identifying the desired digital formats. These acquisition and conversion efforts and these digital formats are achievable first steps towards the goal of the DoN's digital data policy, viz., an integrated data environment. The data standards referenced are the best available for the data types identified and comply and agree with the DoN Information Technology Standards Guidance. The latest versions of all standards are to be assumed unless otherwise specifically identified within the guidance. As the standards and related digital technologies mature, as DoN requirements evolve, and as the understanding of the Integrated Data Environment (IDE) matures, this guidance will change, clarify, and expand.

This guidance document focuses on logistics technical data that takes the form of engineering data, schematics, drawings, and technical manuals because digital formats for these forms are supported by published commercial and Government performance standards and common DoN conventions and practices. Many other components of acquisition and life cycle support logistics data, such as provisioning, configuration management, software/firmware and supply support, are not addressed because neither suitable standards nor DoN consensus exist on the treatment of these forms of digital data. When the DoN agrees on these standards and conventions, they will be incorporated within this document.

The DoD Continuous Acquisition and Life Cycle Support (CALS) initiative has published or endorsed commercial and military performance specifications and standards for the data types discussed in this guidance, specifically: 1) character data and document text, 2) raster data (bitmaps), 3) vector data (lines), and 4) Computer Aided Design (CAD) data (models). These four data types constitute major components upon which an integrated digital environment is built, e.g., publications, drawings, and engineering models. Guidance to help program managers make informed decisions in the acquisition of this digital data as well as an overview of CALS standards is provided by the Naval Surface Warfare Center Carderock Division in conjunction with the Navy CALS Program Office [http://navycals.dt.navy.mil/calsstds.html and http://navycals.dt.navy.mil/calsdata/]. New programs are encouraged to develop a Government Concept of Operations (GCO) as part of the acquisition process. The GCO should address the configuration status accounting of the data, the types of digital data to be acquired, and how it is to be stored, managed, distributed and used within the DoN community and its associated information technology infrastructure.

The data formats and conventions to be used for the digital logistics technical data covered by this guidance and which will form the basis for the DoN IDE are summarized below. The formats and data standards recommended within this document are summarized in tables

contained in Appendix A. Appendix B is a guide to World Wide Web resources providing additional information for implementation of digital technical data.

2. ACCESS CONTROL FOR DIGITAL DOCUMENTS

All documents, whether created digitally or subsequently digitized from paper or aperture cards, must be properly marked for access control, including as applicable: the document's security classification, export control status, no-foreign-access status, distribution statement, and data rights limitations. Security and access control requirements and procedures apply to digital data just as they do to paper or other hard copy documents. Digital technologies and formats for encryption and secure transfer of data will be addressed in future versions of this guidance document when DoN agrees upon suitable standards and conventions. The formats and conventions identified in this Guidance have been selected to guarantee that the digital data is created, received, maintained, and distributed in common neutral formats that will minimize and simplify DoN corporate investments in viewing and application software.

3. SPECIFICATIONS FOR DRAWINGS AND ENGINEERING DATA

This section deals with formats for two and three dimensional product data including models, drawings, schematics, and illustrations and also geospatial data deliverables for installations and facilities. Included are Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), and Computer Aided Engineering (CAE) product data for weapon systems and platforms as well as architecture, engineering, and construction data for facilities.

3.1 Product Data and CAD Data

Product data, engineering design and manufacturing data (CAD/CAM/CAE), 3-D vector data, and product model data should be delivered in a data definition format for neutral file exchange in accordance with one of the following specifications:

- Initial Graphics Exchange Specification (IGES) in accordance with MIL-PRF-28000 or, where MIL-PRF-28000 not applicable, US PRO/IPO 100
- Standard for the Exchange of Product Model Data STEP (ISO 10303)
- National Shipbuilding Research Program (NSRP) documents specifying the Navy/Industry Digital Data Exchange Standards Committee (NIDDESC) STEP Application Protocols (APs) for the exchange of ship engineering data:
    - NSRP Document No. 0424, NIDDESC Piping Application Protocol
    - NSRP Document No. 0425, NIDDESC Electrical/Cableway Application Protocol
    - NSRP Document No. 0426, NIDDESC Heating, Ventilation, and Air Conditioning (HVAC) Application Protocol
    - NSRP Document No. 0428, NIDDESC Outfit and Furnishings Application Protocol

- NSRP Document No. 0429, NIDDESC Ship Structure Application Protocol

STEP (ISO 10303) is the preferred format for Product and CAD data in those areas for which a STEP application protocol is defined.

This product data and CAD data may be delivered in native CAD formats, subject to the approval of the program office. However, the IGES or STEP standard formats should be used for interchange with the Navy information infrastructure and the general DoN user community.

3.2 Computer Aided Drafting and Design Data for Naval Facilities and Installations

CADD drawings used for the planning, design, construction, operations, maintenance and demolition of Department of the Navy facilities and installations should be delivered in conformance with the National Institute of Building Sciences (NIBS) National CADD Standard. This standard is developed and maintained by the American Institute of Architects (AIA), the Construction Specification Institute (CSI) and the Tri-Service CADD/GIS Technology Center with support from the United States Coast Guard under the auspices of NIBS. Information as to the standards availability can be obtained from any one of the participating organizations or from NIBS [http://www.nibs.org]. Drawings should be prepared for bid solicitation in accordance with the Electronic Bid Solicitation (EBS) policy NAVFACINST 4250.1 dated 31 January 1999.

3.3 Digital Geospatial Data Deliverables for Naval Installations

Digital geospatial data used for management of Department of the Navy facilities and land should be delivered in conformance with the *Tri-Service Spatial Data Standards* developed by the Tri-Service CADD/GIS Technology Center. These standards are harmonized with and extend the Federal Geographic Data Committee (FGDC) [http://www.fgdc.gov/] standards required by Executive Order 12906 of 11 April 1994, "Coordinating Geographic Data Acquisition And Access: The National Spatial Data Infrastructure". Department of the Navy facilities geospatial data should be documented using the FGDC *Content Standard for Digital Geospatial Metadata (CSDGM.* The metadata should be made electronically accessible to the National Spatial Data Clearinghouse [http://www.fgdc.gov/clearinghouse/clearinghouse.html] by submission to the Tri-Service CADD/GIS Technology Center node [http://tsc.wes.army.mil/metadata/] of the Clearinghouse.

3.4 2-D Drawings, Illustrations, and Schematics

Two dimensional drawings, illustrations, and schematics, not intended for CAD applications, may be delivered in several different formats depending on the image, itself, and the intended use of the image. BMP is a non-vector format suitable for color photographic images. JPEG (Joint Photographic Experts Group) is an international standard for color image compression. JPEG allows selectable compression ratios that achieve smaller files sizes at the expense of image fidelity (a so-called "lossy" compression of the image). JPEG is suitable for applications requiring conveyance of only a visual image with no requirement for precise detail or need to

index or navigate using text or graphic elements. The Computer Graphics Metafile (CGM) is recommended for 2-D vector graphics applications requiring image fidelity or identification or navigation among component elements. New graphics and illustrations for all types of technical manuals should be delivered in CGM (ISO/IEC 8632). Images required for use in Computer Aided Design (CAD) environments should be delivered in engineering CAD formats. Details on these formats are provided below.

3.4.1 2-D Vector Images Not Intended for CAD

Two dimensional drawings, illustrations, and schematics, not intended for CAD applications, should be delivered in digital 2-D vector format in accordance with the CGM data standard. To achieve effective interchange of CGM, an implementation profile must be cited in addition to the ISO/IEC 8632 specification. Two profiles, MIL-PRF-28003 and the WebCGM recommendation, are available for DoN CGM data. One of these profiles should be selected to match the intended use of the CGM data as discussed below.

Delivery of static images should be specified in accordance with the CALS profile, MIL-PRF-28003, for CGM. MIL-PRF-28003 defines a military profile for CGM that supports Versions 1, 2, and 3 of CGM. Versions 1, 2, and 3 of CGM define progressively larger sets of graphic primitives with which to build progressively more complex vector graphic images. For graphic images supporting WWW navigation, hot spotting and hyper-linking among graphic components and text elements, delivery should be specified in accordance with the WebCGM recommendation, REC-WebCGM-19990121, published by the World Wide Web Consortium (W3C). The WebCGM recommendation defines a profile for Version 4 CGM, which permits the definition of hotspots and other intelligent data to be associated with graphical elements in the CGM data. The WebCGM profile is designed to guarantee interoperability of different vendor applications of CGM, Version 4. Although WebCGM is newly published, it was developed by CGM Open through the collaboration of the major CGM software tool developers. These tool developers are expected to support WebCGM in their next product releases. WebCGM also supports Versions 1, 2, 3 of CGM and at that level is compatible with MIL-PRF-28003.

3.4.2 2-D Images Intended for CAD

Two dimensional drawings, illustrations, and schematics, intended for CAD applications, should be delivered in accordance with one of the following specifications:

- Initial Graphics Exchange Specification (IGES), in accordance with MIL-PRF-28000, Class II.
- Standard for the Exchange of Product Model Data (STEP), ISO 10303, AP 201 (Explicit Draughting)or AP 202 (Associative Draughting)

These drawings may be delivered in native CAD formats, subject to the approval of the program office. However IGES or STEP formats should be used for interchange with the Navy information infrastructure and the general DoN user community.

3.4.3 Indexing 2-D Drawings, Illustrations, and Schematics

Users must deliver all 2-D drawings and illustrations with complete and accurate indexing data. Indexing data are identifiers and attributes that allow the receiver of the images to associate each with complete documents, and to associate documents with one another and with the correct material items. The images should be delivered as required by the JEDMICS Compact Disk Engineering Data Exchange (preferred) or as designated by MIL-STD-1840C.

3.5 Conversion of Legacy Drawings to Digital Format

Conversion of legacy data to digital involves careful business decisions regarding what to convert and what format the conversion should deliver. Conversion to vector formats is more expensive that conversion to bitmap or raster data but the vector data can be more versatile and easier to update. The legacy graphics themselves should be carefully assessed as to their importance and continuing usefulness with respect to product life cycle and maintenance.

Existing (legacy) hard-copy paper and aperture card drawings, illustrations, and schematics should be converted, to either the CGM vector format, in accordance with the specifications discussed in section 3.4.1 above, or to a raster format in accordance with MIL-PRF-28002. The conversion to raster is generally cheaper but provides a bitmap image of the original that is not easy to modify. The conversion to vector can often result in digital image files that are larger than those produced by raster conversion and just as difficult to manipulate, unless human intervention is included in the conversion process to improve the vector images. The human intervention desirable in vector conversion can achieve efficiency in file sizes and subsequent manipulation at the expense of higher conversion costs. The preferred raster formats in MIL-PRF-28002 are either the Joint Engineering Data Management Information and Control System (JEDMICS) C4 (CALS Type 4) compressed image format, or the Navy Image File Format (NIFF) (CALS Type 3) compressed image format, or the CCITT Group 4 (CALS Type 1) compressed format specified therein. DoN acquisition and conversion efforts should not use the ODA/ODIF format (CALS Type 2) included within MIL-PRF-28002. The C4 format is recommended for engineering drawings to be easily accommodated within JEDMICS and ATIS (Automated Technical Information System). The NIFF format is recommended for technical manuals and their use in ATIS.

4. SPECIFICATIONS FOR TECHNICAL MANUALS/DOCUMENTS

4.1 New Technical Manuals

All new technical manuals should be acquired and authored in digital form in the Standard Generalized Markup Language (SGML) in accordance with MIL-PRF-28001 as defined below. The U. S. Marine Corps acquisitions should follow specific USMC guidance contained in Section 4.2.

4.1.1 Formats and Deliverables for New Technical Manuals

All new technical manuals (TMs), Electronic Technical Manuals (ETMs), and Interactive Electronic Technical Manuals (IETMS) will be acquired in Standard Generalized Markup Language (SGML) format in accordance with MIL-PRF-28001. MIL-PRF-28001 is the DoD performance specification defining the DoD requirements (Military interpretation or profile) for the application of the International Standard for SGML, ISO 8879, *Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML)*. Proper creation of a document in SGML requires a Document Type Definition (DTD), an SGML data construct defining the structure and content of the type of document to be created as well as the definitions and rules for applying SGML in the authoring process. DTDs are complex and costly to develop but may be created to satisfy a broad range of documents. Authors and contractors should be encouraged to use existing Document Type Definitions (DTDs) and style sheets or FOSIs for all TMs/ETMs/IETMs. DoN DTDs are currently stored in the Navy DTD/FOSI Repository (http://navycals.dt.navy.mil/dtdfosi/repository.html).

TM/ETM/IETM delivery to the Government must include the SGML source file, the associated DTD, entity files, DTD Data Dictionary, and Tagging Conventions Document, all of which are necessary to manage, maintain, edit, and re-author the documents. Delivery must also include the style sheets, FOSIs, filters, necessary to produce the desired presentation to users. The SGML source file consists of the TM text with the embedded SGML tags. This file is what will be stored and maintained in a repository or database at the document management activity. Entity files are files associated with the source file that may be created and referenced by the DTD. They usually are created when there is standard text in the document that will be used or shared among instances of a class of documents. The contents of the entity files are available to any document using the associated DTD. The DTD Data Dictionary defines the meaning of SGML tags used, and the Tagging Conventions document describes the rules for applying each SGML tag, especially if new or custom DTDs are being used. The information contained within the Dictionary and Conventions documents will be helpful in the maintenance and revision of the TMs and should also be provided to the Navy DTD/FOSI Repository.

4.1.2 HTML for New Manuals

The Hyper Text Markup Language (HTML) is a specific SGML application, a standardized SGML DTD, commonly used for the formatting and delivery of data on the World Wide Web (WWW) using standard software browsers. It consists of a limited, fixed set of tags and merely identifies areas in a document to affect formatting. HTML contains no content tags and only minimal structure tags.

HTML is not a suitable format for the storage and management of new technical manual data. DoN activities should receive and manage documents in SGML in accordance with a DTD that describes some degree of multi-level structure and content of the manual. If an HTML version of the manual is desired for delivery and presentation, program and document managers should require delivery of the manual in SGML in accordance with a MIL-PRF-28001 compliant DTD in addition to the HTML deliverable. If a contractor develops conversion software or filters to convert the SGML document to an HTML document, the DoN procurement activity should request delivery of the conversion software also.

Programs choosing to acquire or create manuals directly in HTML will have very limited content management capability and limited ability to use the data re-use and content searching functionality provided by SGML document management tools. If, however, a program choose to author manuals in HTML, it should require delivery of the HTML DTD used for authoring. Since there are many versions and browser extensions of the HTML DTD, a copy of the one actually used for authoring should be retained with the manual(s) to do updates and revisions.

4.1.3 XML for New Manuals

The eXtensible Markup Language (XML), considered the next evolution of HTML, is not just an application (or DTD) of SGML but rather a subset of SGML conceived to more easily provide SGML on the WWW. XML's goal is to enable generic SGML to be served, received, and processed on the WWW in the way that is now possible with HTML. Features of ISO 8879 (SGML) that were deemed too difficult for machine processing have been removed to create XML. Applications of XML, therefore, require the same constructs, such as DTDs, as SGML. Programs and acquisition managers should require the same deliverables for XML TMs as required for SGML TMs in Sec. 4.1.1.

4.1.4 Composition and Presentation Information

Since an SGML file contains no formatting information, presentation applications use descriptions of formats called style sheets or FOSIs to determine what style/format to apply to a TM written to a DTD. Style sheets and FOSIs apply to a DTD, not just a single SGML file. Filters are translation programs or software that convert one encoded data stream, such as SGML text, into another data stream with codes that can be readily

interpreted and processed by the user's equipment and software. Filters may be developed to translate, or "filter", an SGML file into an HTML file. This may be done when the TM Management Activity wants to store and manage data in SGML but have HTML as one method of delivery/presentation.

4.1.5 IETMs and Electronic Technical Manual Functionality

The variances in electronic presentation form and the ranges of embedded functionality have resulted in a very broad spectrum of electronic technical manual implementations making discussion and comparison of alternate systems and approaches difficult. Electronic Technical Manuals (ETMs) may range from electronic images of paper pages to highly Interactive Electronic Technical Manuals (IETMs) designed and authored specifically for electronic screen presentation. High-end functionality can add significant cost to the development and maintenance of the IETM and programs should match the high functionality to applications where it can return suitable value. Highly dynamic IETMs whose content is more of a database form than sequential text, whose structure is more tree-like than linear, and whose presentation is highly dependant on user and data interaction, may be specified on contract by citing the military performance specifications, MIL-PRF-87268 and MIL-PRF-87269. MIL-PRF-87268 prescribes the user interface and presentation format for these IETMs. MIL-PRF-87269 presents an approach and a DTD that can be used as guides for developing these high-end IETMs in the absence of other suitable DTDs. The implementation and interpretation of MIL-PRF-87269, however, is both difficult and subjective, and the DoD and the Services have provided no clear and specific guidance on its use. As a result, few IETMs compliant with MIL-PRF-87269 show common interpretations of the standard.

The *Interactive Electronic Technical Manual (IETM) Process Plan (IETMPP)*, (DoN TMINS #S005-AD-PRO-010, Revision 1, Nov '95), accepted as the guidance plan for the Naval Sea Systems Command and Naval Space and Weapons Systems Command, contains additional information on the variance in ETM functionality and other management considerations for authoring, management, use, availability of infrastructure, and cost to acquire/convert and maintain ETMs and IETMs. It also provides additional guidance on various IETM features, such as expert systems, training content, audio/video, and object or linear database.

4.1.6 Acquisition of New Technical Manuals for the Marine Corps

In accordance with Marine Corps Order 5215.7, "The Marine Corps Technical Publications System", digital data publications are required for all new Marine Corps programs with an initial operating capability (IOC) during FY 2000 and beyond, unless a waiver is approved by the Commander, Marine Corps Systems Command.

Program Managers (PMs) shall identify unique or usual user environments not serviced by Marine Corps Common Computer Hardware Suites and items that may not be conducive to digital data to the Director, Program Support. When developing ETMs,

contractors will normally be required to use the Interactive Authoring and Display System (IADS) Government furnished software identified in Marine Corps Order 5215.7. PMs should ensure that any proprietary or contractor-proposed authoring software, other than IADS, is compatible with the IADS reader application. PMs shall budget and fund for electronic publications for all systems with an IOC during FY 2000 and beyond.

4.2 Conversion of Legacy Technical Manuals and Documents to Digital

The DoN, subject to availability of funding and justification by cost benefit analysis, will convert legacy (including hard-copy and raster) TMs to a digital format. Specific guidance for U. S. Marine Corps conversion efforts is contained in section 4.2.4.

4.2.1 SGML Conversion

Legacy TMs, which experience high usage, extensive life cycle, and frequent revision, should be converted to SGML. Program and document managers must require delivery of SGML in accordance with a MIL-PRF-28001 compliant DTD that is suitable for the document being converted. Where possible, existing DTDs, style sheets, and FOSIs should be used. Programs should require conversion of content and should not demand full or detailed replication of the format and pagination of the original legacy documents as this will greatly increase the complexity and cost of the conversion effort. If a new DTD is used for the conversion, the program should request delivery of the DTD as well as other files identified in section 4.1.1 with the SGML data to enable the DoN to properly maintain the SGML documents.

4.2.2 HTML Conversion

HTML, the Hyper Text Markup Language (RFC 1866), is a specific SGML application or DTD that provides a uniform means for creating documents for presentation and viewing on the World Wide Web using standard software browsers. In this context, HTML is an acceptable digital format for distribution and presentation of TMs. The HTML DTD, itself, is not suitable for storage and management of data since it contains no content tags and only minimal structure tags. HTML merely identifies areas in a document to affect formatting and is not meant to identify data for storage and management. If conversion to HTML is desired, program and document managers should require delivery of documents converted to SGML in accordance with a MIL-PRF-28001 compliant DTD in addition to the HTML deliverable. By requiring delivery of SGML and its DTD, the DoN will be better able to manage updates and revisions to the document. If the contractor develops conversion software or filters to convert the SGML document to an HTML document, the program should request delivery of the conversion software also. The DoN's intention is to receive and manage documents in SGML and, if desired, convert to HTML only for distribution and presentation purposes. If a program chooses to convert directly to HTML and not another SGML DTD, it should require delivery of the HTML DTD used for conversion. This DTD will be necessary for

management and revision of the HTML documents since there are many versions as well as browser extensions of the HTML DTD.

4.2.3 Raster Conversion

Raster and hard-copy legacy manuals that are not suitable for conversion to SGML may be converted to the Portable Document Format™ (PDF) by Adobe Systems Inc., the Page Description Language (PDL), or the Navy Implementation for Raster Scanning (NIRS)/Navy Image File Format (NIFF) for distribution and use. All of these formats are recommended only for presentation to users and will not support document edits and revisions. PDF is a popular commercial format, owned by Adobe Systems, that has achieved widespread use through availability of free viewer software. Activities can contract for conversion to PDF or can convert documents themselves by purchasing the Adobe Capture software. PDL formats use software that resides within printers and defines how elements such as text and graphics appear on the printed page. PostScript is the industry standard page description language. NIRS/NIFF can be cited by referencing Type 3 raster conversion in the raster performance specification, MIL-PRF-28002. TIFF recently achieved international standardization status and is widely interchangeable with common computer systems.

The conversion of paper (or raster) to PDF or PDL generates an ASCII rendition as an interim product. If this ASCII is available, it should be saved as a possible basis for performing revisions to the document. Managers, who are converting documents to PDF or PDL, should also request delivery of the ASCII or other revisable files, if they exist, to satisfy future revision and edit needs. If revisable files are not available, they should be created only when needed. Adobe's PDF allows minimal editing on a line by line basis using the Adobe Acrobat Exchange software, however, PDF is not recommended as a suitable format for content management, editing, and long-term configuration management of the document content.

Hard-copy paper (legacy) TMs may be raster scanned in accordance with the Navy Implementation for Raster Scanning (NIRS)/DoN Image File Format (NIFF) specified in MIL-PRF-28002.

Programs should be aware that viewing raster scanned foldout illustrations and schematics is a problem for users without oversized monitors unless the foldout images are re-authored or reprocessed to satisfy the viewing software or special viewing software is provided.

4.2.4 Conversion of Marine Corps Legacy Manuals to Digital Format

All Marine Corps legacy TMs will be converted to an indexed Adobe Portable Document Format (PDF), placed on CDs, and made available to the Fleet Marine Force. High usage legacy TMs may be converted to SGML for conversion to an IETM in accordance with Marine Corps Order 5215.17.

4.3 Publication and Distribution and Management

TMs should be published in electronic technical manual (ETM or IETM) formats suitable for distribution and use based upon availability of the requisite hardware and software in the user community.

The DoN will cease the practice of creating, managing, stocking, and distributing change-pages. TM/document editing and management should be performed at a document component level through processes suitable for an SGML document environment. Under this approach, when a document is modified, only the component(s) added/deleted/changed are modified in the document repository or database. A new version of the whole document does not have to be stored. When data is managed at a component level, components that are common to multiple document instances (e.g., cautions, warnings) can be edited and managed in one spot and shared among documents. This eliminates redundancy as well as increases accuracy of data. Updates of user digital documents will be distributed at a full document level.

At present, there is no DoN consensus concerning highlighting or identification of document changes or procedures for notification of users of those changes. Activities should define and employ change identification and user notification procedures that best fit their TM management and usage practices.

DoN digital TMs are intended to be used with software applications and infrastructure systems compliant with the DII COE. New TM/ETM/IETM developments should be compliant with the DII COE.

5. DELIVERY OF LOGISTICS TECHNICAL DATA

Since not all users have the latest computer technology, it may be necessary to reproduce the digital data in traditional hardcopy forms.

5.1 Delivery of Schematics and Fold-out Drawings

Particular consideration should be given to digital foldout drawings and long line schematics, which can be difficult to work with in electronic form. Paper copies of these drawings are often considered necessary for their effective use by technicians. For this reason, programs and data management activities should be prepared to provide drawings in easily readable paper copies to users. These special considerations for foldouts and schematics should remain in effect until the user community has the capability to view and print them when needed.

REFERENCES

ENGINEERING DRAWINGS AND ASSOCIATED DATA REFERENCES

CAD and Product Data

MIL-PRF-28000A, Amendment 1, 14 December 1992, *Digital Representation for Communication of Product Data: IGES Application Subsets and IGES Application Protocols*

Initial Graphics Exchange Specification (IGES), IGES (ANS US PRO/IPO-100 Series), https://www.uspro.org/

3D Piping IGES Application Protocol, ANS US PRO/IPO-110-1994

IGES Layered Electrical Product Application Protocol (AP), ANS US PRO/IPO-111-1997

Standard for the Exchange of Product Model Data (STEP), ISO 10303

Product Data Exchange using STEP (PDES), (ANS US PRO/IPO-200 Series)

National Shipbuilding Research Program (NSRP) Navy/Industry Digital Data Exchange Standards Committee (NIDDESC) STEP Application Protocols (APs):

NIDDESC Piping AP, NSRP 0424, (ISO 10303 Draft AP 217)
NIDDESC Electrical & Raceways AP, NSRP 0425, (ISO 10303 Draft AP 212)
NIDDESC Heating Ventilation, and Air Condition (HVAC) AP, NSRP 0426, (ISO 10303 Draft AP 228)
NIDDESC Outfit and Furnishings AP, NSRP 0428
NIDDESC Ship Structural Systems AP, NSRP 0429, (ISO 10303 Draft AP's 215, 216, 218)

Geospatial Data for Naval Installations

Tri-Service Spatial Data Standards, Tri-Service CADD/GIS Technology Center, Technical Report CADD-98, July 1998, http://tsc.wes.army.mil

Content Standard for Digital Geospatial Metadata, CSDGM, Version 2, Federal Geographic Data Committee, http://www.fgdc.gov/metadata/contstan.html

Vector Data

MIL-PRF-28003A, Amendment 1, 14 August 1992, *Digital Representation for Communication of Illustration Data: CGM Application Profile*

International Standard ISO/IEC 8632:1992, *Information Technology – Computer Graphics Metafile for the Storage and Transfer of Picture Description Information*

The WebCGM Recommendation, REC-WebCGM-19990121, http://www.w3.org/TR/REC-WebCGM

JPEG International Standard, ISO 10918.1

JPEG, Still Image Compression Standard, William P. Pennebaker & Joan L. Mitchell, Van Nostrand Reinhold, New York, 1993

Raster Data

MIL-PRF-28002C, 30 September 1997, *Raster Graphics Representation in Binary Format, Requirements for*

Portable Document Format Reference Manual (PDF), Adobe Systems Inc.

TECHNICAL MANUAL REFERENCES

MIL-PRF-28001C; 2 May 1997 *Markup Requirements and Generic Style Specification for Exchange of Text and its Presentation (SGML)*

International Standard ISO 8879, *Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML)*, International Organization for Standardization, 1986.

Amendment 1 to ISO 8879, International Organization for Standardization, 1987.

ISO/IEC JTC1/SC34 N0029, *Document Description and Processing Languages, Annex K (Normative): Web SGML Adaptations* - December 6, 1998 http://www.sgmlsource.com/8879rev/n0029.htm

HTML 4.0 Specification - 24 April, 1998 http://www.w3.org/TR/REC-html40/

Extensible Markup Language (XML) 1.0, W3C Recommendation, 10 February 1998, REC-xml-19980210. http://www.w3.org/TR/REC-xml

MIL-PRF-87268; November 1992, *Manual, Interactive Electronic Technical; General Content, Style, Format, and User Interaction Requirements*

MIL-PRF-87269; November 1992, Data Base Revisable, Interactive Electronic Technical Manuals for Support of

MIL-HDBK-28001; 30 June 1995, *Application of MIL-PRF-28001 Using Standard Generalized Markup Language (SGML)*

Interactive Electronic Technical Manual (IETM) Process Plan (IETMPP), (DoN TMINS #S005-AD-PRO-010, Revision 1, Nov '95

SPECIFICATIONS AND STANDARDS GENERAL REFERENCES

MIL-STD-1840C; 26 June 1997, *Automated Interchange of Technical Information*

Information Technology Standards Guidance, Version 99-1, 5 April 1999, DoN CIO ITSG Integrated Product Team, http://www.doncio.navy.mil/itsgpublic/

Appendix A

DIGITAL DATA STANDARDS & SPECIFICATIONS TABLES

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These tables present a quick guide to data formats and standards. The information is compliant with the DoN Information Technology Standards Guidance published by the DoN Chief Information Officer (CIO).

TABLE 1 - Legacy Data Conversion

LEGACY FORM	DESIRED CONVERSION	STANDARDS & SPECS
TECHNICAL MANUALS	Conversion to SGML	SGML per MIL-PRF-28001 Use existing DTD or Use new DTD & Request delivery of DTD
	Conversion to HTML (Preferred method; supports life cycle management of the converted TM)	Convert first to SGML per MIL-PRF-28001 Use existing DTD or Use new DTD & Request delivery of DTD and Convert SGML to HTML and Deliver SGML, DTD, and HTML
	Conversion to HTML (Alternate method; life cycle management of TM may be difficult due to instability of HTML DTD)	Convert direct to HTML per existing version of HTML DTD and Deliver HTML and the HTML DTD used
	TM Conversion to Raster	PDF per Adobe Systems, Inc or PDL or MIL-PRF-28002 Type 3
GRAPHICS	Conversion of hardcopy graphics/aperture cards to raster	C4 (JEDMICS) per MIL-PRF-28002 Type 4 or MIL-PRF-28002 Type 3
	Conversion of hardcopy or raster graphics to vector	CGM per MIL-PRF-28003
	Conversion of hardcopy or raster graphics to vector with hyperlink capability	CGM, Level 4, per WebCGM

TABLE 2 - Technical Manual Creation

DESIRED FORM	Text STANDARDS & SPECS	Graphics	Graphics Standards and Specifications
Electronic Technical Manuals (ETMs)	MIL-PRF-28001-SGML Use existing DTD or Use new DTD & Request delivery of DTD	2-D vector graphics for illustrations & TMs --- 2-D graphics for hyperlinked illustrations --- Raster (bitmapped) images	MIL-PRF-28003 -CGM --- CGM Level 4 per WebCGM --- MIL-PRF-28002 Type 1 – CCITT.G4
Interactive Electronic Technical Manuals (IETMs)	MIL-PRF-28001-SGML Use MIL-PRF-87269 as guide to DTD User interface per MIL-PRF-87268	2-D vector graphics for illustrations & TMs --- 2-D graphics for hyperlinked illustrations --- Raster (bitmapped) images	MIL-PRF-28003 -CGM --- CGM Level 4 per WebCGM --- MIL-PRF-28002 Type 1 – CCITT.G4

TABLE 3 - Product Data Creation

APPLICATION	STANDARDS & SPECS
2-D graphics for use in CAD	IGES V5.3 per MIL-PRF-28000 Class II or STEP per ISO 10303 AP201 or AP 202
Product data CAD/CAM/CAE 3-D vector Product Model	Native CAD format and Neutral format per MIL-PRF-28000, or IGES per ASME Y14.26 IGES Version 5.3 or STEP per ISO 1030
Ship Design	STEP per following: NSRP Doc 0424 Piping AP NSRP Doc 0425 Electrical/Cableway AP NSRP Doc 0426 HVAC AP NSRP Doc 0428 Outfit and Furnishings AP NSRP Doc 0429 Ship Structure AP

Appendix B

WWW RESOURCE GUIDE
FOR DIGITAL TECHNICAL DATA IMPLEMENTATION

http://www-cals.itsi.disa.mil/core/formal/fps.htm	Download CALS standards
http://www.acq.osd.mil/log/lro/toolkit/opening.html	CALS Toolkit
http://navycals.dt.navy.mil/classes.html	IETM classes
http://navycals.dt.navy.mil	Navy CALS Web site
https://www.uspro.org/	Catalog of STEP standards
http:/www.usnet.com/NIDDESC/t23.html	Shipbuilding product model data
http://www.acq.osd.mil/log/lro/	OSD Logistics Reinvention Office
http://calsric.crane.navy.mil/default.htm	Navy CALS Resource and Implementation Cooperative (RIC)
http://www.doncio.navy.mil	DoN Chief Information Officer
http://www.doncio.navy.mil/itsgpublic/	Information Technology Standards Guidance
http://www/n4/hq/navy/mil	Deputy Chief of Naval Operations for Logistics OPNAV N4 Logistics
http://www.peoarbs.navy.mil	Program Executive Officer for Acquisition Related Business Systems (PEO(ARBS))
http://spider.osf1.disa.mil/cm/dii/	Defense Information Infrastructure (DII) Common Operating Environment (COE)
http://www.adobe.com/proindex/postscript/PDFS/highres_book.pdf	How to create Adobe PDF files for print and press
http://www.oasis-open.org/cover/sgml-xml.html	SGML & XML information
http://navycals.dt.navy.mil/dtdfosi/repository.html	Navy DTD Repository
http://www-jta.itsi.disa.mil/	DoD Joint Technical Architecture (JTA)

Appendix C

LIST OF ACRONYMS

Acronym	Definition
2-D	Two Dimensional
3-D	Three Dimensional
AP	Application Protocols
ASCII	American Standard Code for Information Interchange
ATIS	Automated Technical Information System
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CALS	Continuous Acquisition and Life-Cycle Support
CAM	Computer Aided Manufacturing
CGM	Computer Graphics Metafile
CIO	Chief Information Officer
COE	Common Operating Environment
CSDGM	Content Standard for Geospatial Metadata
DID	Data Item Description
DII	Defense Information Infrastructure
DoN	Department of the Navy
DRPM	Direct Reporting Program Manager
DSSSL	Document Style Semantics and Specification Language
DTD	Document Type Definition
ETM	Electronic Technical Manual
FGDC	Federal Geographic Data Committee
FOSI	Formatting Output Specification Instance
GCO	Government Concept of Operations
HTML	Hyper Text Mark-Up Language
IADS	Interactive Authoring and Display System
IDE	Integrated Data Environment
IETM	Interactive Electronic Technical Manual
IETMPP	Interactive Electronic Technical Manual Process Plan

IGES	Initial Graphics Exchange Specification
ISO	International Standards Organization
JEDMICS	Joint Engineering Data Management Information and Control System
JPEG	Joint Photographic Experts Group
NIBS	National Institute of Building Sciences
NIDDESC	Navy/Industry Digital Data Exchange Standards Committee
NIFF	Navy Image File Format
NIRS	Navy Implementation for Raster Scanning
NSRP	National Shipbuilding Research Program
NSWC	Naval Surface Warfare Center
ODA	Open Document Architecture
ODIF	Open Document Interchange Format
PDF	Portable Document Format
PDL	Page Description Language
PEO	Program Executive Officer
PM	Program Manager
SGML	Standard Generalized Markup Language
STEP	Standard for Exchange of Product Model Data
SYSCOM	System Commander
TM	Technical Manual
TMINS	Technical Manual Identification Numbering System
W3C	World Wide Web Consortium
WWW	World Wide Web
XML	Extensible Markup Language

Appendix D

ISSUES FOR FUTURE GUIDANCE

This section identifies additional areas or components of logistics data for which no suitable DoN wide guidance can be given for treatment in digital form. When sufficient standardization occurs, and vendor products provide suitable support, and the DoN is prepared to set corporate-wide conventions, specific guidance will be developed and incorporated into the DoN policy. Areas awaiting guidance formulation are:

Digital Signatures
Digital Drawing Release, Validation, Authentication (signature)
Encryption
Guidance for IT-21 Certification
Shipboard Display Devices
Rationale for PMs to use for web-based delivery
Guide to Conversion and Conversion cost